What is claimed is:

1    1.    An integrated circuit comprising:

2          a parallel frame delineation module having a plurality of concurrent

3    comparators to delineate received frame boundaries within a Universal Serial Bus

4    (USB) peripheral non-return to zero invert (NRZI) data stream; and

5          an NRZI decoder module to decode received NRZI encoded data using

6    parallel data processing.


1    2.    The integrated circuit of claim 1, wherein the USB peripheral NRZI data

2    stream follows a protocol defined in version 2.0 of the USB specification.


1    3.    The integrated circuit of claim 2, wherein the parallel frame boundary

2    delineation module comprises a three-stage pipeline.


1    4.    The integrated circuit of claim 3, further comprising a pipeline control state

2    machine.


1    5.    The integrated circuit of claim 3, wherein the parallel frame boundary

2    delineation module further comprises a parallel start-of-packet detector.


1    6.    The integrated circuit of claim 5 wherein the parallel start-of-packet detector

2    comprises eleven concurrent comparators.


1    7.    An apparatus comprising:

2          one or more Universal Serial Bus (USB) connectors to couple to a

3    communications channel carrying a USB data stream;

4          an application specific integrated circuit comprising a USB transceiver, a

5    serial interface engine and apparatus-specific logic, the USB transceiver having

6    concurrent comparators to delineate received asynchronous frame boundaries within

7    the USB data stream and parallel logic to decode received encoded data.

1  8.    The apparatus of claim 7, wherein the apparatus-specific logic comprises

2  logic for an apparatus selected from the group consisting of: a hub, a digital camera,

3  a video-conferencing camera, a printer, a keyboard, a scanner, a modem, a digital

4  phone, a removable media drive, a CD/DVD drive, a gaming device, a hard drive, a

5  mouse, a trackball, a pointer, a display device, a speaker and a networking device.


1  9.    The apparatus of claim 7, wherein the parallel logic decodes non-return to

2  zero invert (NRZI) encoded data.


1  10.    A method of delineating asynchronous frame boundaries in a Universal

2  Serial Bus (USB) data stream, the method comprising:

3        receiving a USB data stream;

4        searching for a frame delineation marker in the data received using

5  concurrent comparators;

6        asserting a flag upon detection of the frame delineation marker; and

7        creating a vector indicating a location of a frame boundary in the data

8  stream.


1  11.    The method of claim 10, wherein the USB data stream comprises non-return

2  to zero invert (NRZI) data.


1  12.    The method of claim 11, wherein the NRZI data is received in nine-bit

2  fields.


1  13.    The method of claim 10, wherein the act of searching for a frame delineation

2  marker is performed concurrently on a twenty-seven bit field of data.


1  14.    The method of claim 13, wherein the frame delineation marker comprises

2  "00101010".

1   15.    The method of claim 10, wherein the act of searching is performed by eleven

2   concurrent comparators.


1   16.    The method of claim 10, wherein the vector created comprises an eleven-bit

2   vector.


1   17.    An integrated circuit comprising:

2          a three-stage pipeline to receive consecutive nine-bit fields of data from an

3   incoming Universal Serial Bus (USB) data stream; and

4          a parallel start-of-packet detector having concurrent comparators to identify

5   a frame delineation marker in the incoming USB data stream.


1   18.    The integrated circuit of claim 17, further comprising a non-return to zero

2   invert (NRZI) data decoder to decode the incoming USB data stream.


1   19.    The integrated circuit of claim 18, further comprising a state machine to

2   determine when the incoming USB data stream contains valid data.